

APPENDIX B

Review Comments

Exhibit B-1. Lake Istokpoga Peer Review Panel Summary – Page 1.**MEMORANDUM**

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To: John Zahina, SFWMD project manager for Lake Istokpoga MFL
From: Thomas E. Lodge, Ph.D., CEP, Science Peer Review Chairperson
Date: July 18, 2005
Subject: Proposed Lake Istokpoga Minimum Flows and Levels (MFL), Final
Science Peer Review Panel Report

This report presents the science review panel's opinions resulting from document review, a field trip on Lake Istokpoga on June 27, and two public workshops held in Lorida, Florida on June 28, 2005. The purpose of these workshops was to evaluate the sufficiency of science used in the "First Draft Technical Documentation to Support Development of Minimum Levels for Lake Istokpoga" developed by the SFWMD Water Supply Department, dated May 2005. The science review panel consisted of Dr. Thomas E. Lodge (chairman), Dr. Joel C. Trexler of Florida International University Department of Biological Science, and Dr. D. Derek Aday of The Ohio State University Department of Evolution, Ecology and Organismal Biology (currently relocating to the North Carolina State University).

CONSENSUS

The science panel agreed on the following:

1. The Lake Istokpoga draft MFL document covers the areas of science needed to establish the MFL criteria. No evidence is presented nor known to the panel indicating that the selected criteria are incorrect, but some areas are weak in scientific credibility, and there is too much use of qualitative language in defending MFL criteria instead of quantitative documentation. With additional data, as defined below, the draft MFL criteria might be shown correct or should be or modified accordingly.
2. Of the criteria, the panel agreed that the level (36.5 ft. NGVD, set at the lower elevation of the emergent littoral zone) and its duration (20 weeks) appeared reasonably defensible. Only the return frequency of the low water level (once in

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four years) is questionable and may be too often, but the panel understood that the MFL criteria are not to be confused with a drawdown schedule. The MFL criteria would only allow such a drawdown frequency without causing a violation. As such, the frequency was viewed as not encumbering a drawdown schedule if CERP or other lake improvement initiatives determine that a new fluctuation schedule with low excursions will be ecologically beneficial.

3. The lack of cypress recruitment among lake's larger, old cypress (seen by the panel on the field trip) clearly demonstrates that the lake has been harmed by the modern restricted fluctuation schedule. Thus, establishing the legal framework for a new schedule that allows for lower levels – part of the function of the MFL – serves to help alleviate significant harm that has already occurred.
4. The gamefish data from before and after the 2001, single-drawdown event are insufficient to demonstrate that recovery actually occurred. The limited time of evaluation after the 2001 drawdown may be too short for the conclusions reached. The heavy dependence on these limited angler data for this single event is the document's weakest aspect.
5. Regarding gamefish data, Table 10 (p. 54) needs to be modified with supporting information in order to provide a credible basis for its use in supporting the MFL criteria. Its weaknesses are:
 - No measure of repeatability
 - Uncertainty is not defined
 - Standard error is not included
 - More explanation is needed to interpret some parameters, e.g., equivalency of combined bluegill and redear sunfish angler success with their separate listings after 1997. If the split data can be totaled to be equivalent to the combined number, it should be so noted.
6. The document should draw upon more literature and data. For example, information, including references, was provided in a letter dated August 16, 2004 from Dr. Mike S. Allen, UF-IFAS, Dept. of Fisheries and Aquatic Sciences, to Beacham Furse, FFWCC for the Lake Istokpoga Ecologic/Hydrologic Performance Measures panel workshop on August 26, 2004). Other useful information would include:
 - larval fish data
 - electrofishing data
 - recruitment data
 - trap net data

If these data cannot be obtained, it is recommended that a monitoring program be developed to improve data collection accordingly.

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7. There is a need to state clearly why water quality is not related to water level considerations for the purpose of establishing the MFL criteria. The panel understood that external loading of phosphorus is Lake Istokpoga's principal water quality problem, coupled with internal nutrient releases from aquatic weed (*Hydrilla*) control. While the overall water-level regime of lakes does affect water quality, the MFL criteria cannot reasonably be used to affect water quality in Lake Istokpoga. The MFL criteria only provide a guideline to avoid significant harm due to low water levels and are not part of a regulation schedule that could be beneficial in improving water quality. However, setting of the MFL criteria should not constrain the reasonable development/implementation of regulation schedules for improving water quality, habitat, etc. It is the panel's opinion that the proposed criteria do not represent a constraint.
8. With reference to the above, the lack of a water quality relationship between the selection of MFL criteria and *Hydrilla* control should be stated. For example, poor water quality resulting from herbicidal control of *Hydrilla* is not related nor under the reasonable control of the MFL criteria.
9. The question of possible mercury contamination in the food chain from drawdown is not sufficiently documented.

DOCUMENT REFINEMENTS NEEDED

1. Incorporate a better context for the Lake Istokpoga 2001 drawdown:
 - Lake Istokpoga fisheries data from pre-and-post-drought/drawdown are currently inadequate to measure benefit/decline in fish populations
 - Expand data base used in the document, including experience on other, comparable lakes
 - There should be more discussion and documentation on benefits other than direct fishery benefits (which must be further evaluated for verification). The value of the 2001 drawdown included the ability of affected landowners and other navigational interests to clean out then-dry navigational channels and boat basins, the removal of accumulated muck sediments from the littoral zone, the removal of tussocks, and the whole-lake treatment of *Hydrilla*, made possible by the low water volume of the lake at that time.
2. Consider modification of the MFL only if additional fisheries data warrant a change in the level, duration, or return frequency demonstrate that significant harm may occur by implementation of the draft MFL criteria.
3. Provide a better explanation for Figure 9 (p. 20). The value of the map cannot be understood by a reader without additional information, and there is an assumption that it is poorly printed rather than a composite of incomplete historic map data.

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4. The term “significantly altered” as used by SWFWMD needs to be defined, (or noted that no precise definition is available).
5. Develop a discussion with data on the lack of recruitment of cypress in the littoral zone where large, old trees occur without younger trees. Testimony at the hearing stated that recruitment began to occur as a result of the 2001 drawdown, only to have seedlings perish as water levels rose. This information is important for establishing that the modern regulation schedule has been damaging because of its insufficient low-water excursions.
6. Make the following edits to the report:
 - Page iii. Significant harm is referenced in Chapter 373 requirements to include flood control, water quality protection, water supply and storage, fish and wildlife protection, navigation and recreation. However, on page iv, it is stated that significant harm “...for Lake Istokpoga is based primarily on impacts to the lake’s biological resources...” The basis of not including the broader suite of categories needs a clearer explanation.
 - Page 3, paragraph under “Legal and Policy...” heading: It should be clarified why “flow” is not an issue in Lake Istokpoga (and most lakes), so that water level is the focus.
 - Page 14, second paragraph. The “Paleogene Epoch” should be changed to the “Paleogene epochs” as it represents the combined time of the Paleocene, Eocene, and Oligocene epochs.
 - Pages 24 (bottom) and 25. The text data do not all agree with the Figure 14. For examples, at 35 ft. the lake volume on Figure 14 is 48,075 ac-ft., not 62,500 ac-ft.; and neither graph extends to 43 ft. as inferred in the text. Also, the “linear” description of the relationship of stage and area might better be “asymptotic.” The text and/or figure should be corrected for agreement.
 - Page 25. Elevations are described here in terms of sea level rather than NGVD as used earlier. It is suggested that the document should be consistent and NGVD is recommended as the standard.
 - Page 39, Table 6. The eastern mosquitofish is *Gambusia holbrooki*; the tadpole “darter” should be the tadpole madtom; and both bullheads listed are now in the genus *Ameiurus*, not *Ictalurus*. Also, a table in a paper by Furse, Champeau, Ford and others dated August 26, 2004 (presented at the Lake Istokpoga performance measures science review panel workshop of that date) included the following additional species, several of which may be ecologically important: blue tilapia (*Oreochromis aurea*), bowfin (*Amia calva*), brown hoplo (*Hoplosternum littorale*), channel catfish (*Ictalurus punctatus*), sailfin molly (*Poecilia latipinna*), walking catfish (*Clarias batrachus*), and white catfish (*Ameiurus catus*). Finally, the grass carp (*Ctenopharyngodon idella*) is mentioned (p. 35) as having been used in aquatic plant control. Is it still present in the lake? A clarification should be

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included as well as better documentation of fish surveys, especially those that relate to the lake fishery.

- Pages 40-41: Conclusions about recruitment and age classes, etc., cannot be inferred from figures 20 and 21. There is no evidence to support the statements and the figures are not useful. It is suggested that a graph be inserted showing length by age or otherwise indicate cohorts on the length-frequency histograms to make it useful.
- Page 42, Plants and Animals of Special Concern. There is no mention of the snail kite – it should be included.
- Page 52, first paragraph. No citations for the burhead sedge (*Osyrcarium cubense*) could be found except as a synonym for the current name, Cuban bulrush (*Scirpus cubensis*). It is suggested the latter names be used or referenced as synonyms.
- Page 54, first paragraph last line. The proper name for the referenced aquifer is “Floridan” aquifer.
- Page 64, line 2, delete word, “a”.
- Page 83, second paragraph. The panel disagrees that addressing environmental impacts from water level stabilization is beyond the project’s scope. *Significant harm* of low water is relative to level fluctuations, and therefore tied to the history of fluctuation stabilization. Setting the level at the low elevation of the existing emergent littoral zone addresses the situation, so the document and selected MFL are still valid, but the wording should reflect that setting a low level is relative to fluctuations that are ongoing and have caused harm by being too restrictive – thus the importance of the MFL being set below the existing control schedule.
- Page 98, bottom paragraph. “...the annual average hydroperiod for lake wetlands may be reduced below the typical range for these community types.” This statement is so vague and general that its value is limited. There is much more specific information available from other lake drawdowns that could be cited. It is suggested this statement be reworded to reflect fishery recovery time and perhaps excessive interference with navigation and recreation, unless specific deleterious effects on littoral zone communities can be documented/referenced.

PANEL’S RECOMMENDATIONS

1. All relevant data for Lake Istokpoga from the Florida Fish and Wildlife Conservation commission and other sources should be obtained and used in the document. It is emphasized that size-specific fish data should be included from relevant studies conducted through more time than the short, post-2001 drydown event for Lake Istokpoga. Dependence on angler surveys should be minimized if alternative sources are available. Useful data would typically come from:
 - Electrofishing for large fish
 - Trap nets for small fish

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If fishery data from the sources recommended above are insufficient, institute a monitoring program to begin collecting this information (also see Item 6 under Consensus).

2. Improve the explanations in document for:
 - Why water quality is not related to setting the MFL minimum level criteria as explained under consensus, above.
 - The lack of cypress recruitment in the littoral zone occupied by the large, aesthetically notable cypress trees. The panel recognized that cypress recruitment is outside of the scope of establishing the MFL criteria – that it would logically be addressed in developing the revised regulation schedule under CERP or other projects. However, a statement should be included that acknowledges the problem and the lack of a relationship to setting the MFL criteria, comparable to clarifying the relationship of water quality to the MFL criteria.
3. Clarify that the timing of drawdowns is outside of this project scope but will be addressed by CERP and other projects.
4. Vegetation monitoring should be implemented (or reported if such data/studies are available). Such monitoring should be:
 - Done through the long term – to detect slow successional changes, for example
 - Appropriate type for use in MFL and CERP pre-project
 - Systematic
 - Stress cypress recruitment because of the high importance of the large cypress trees around the lake (e.g. for osprey nesting and other habitat benefits, aesthetics, etc.)

The panel will agree, if consensus/document refinements and panel recommendations are completed, that the MFL criteria are based upon best available science and are reasonable.

Exhibit B-2. Review Comments by Dr. D. Aday – Page 1.

Review of MFL for Lake Istokpoga
D. Derek Aday
The Ohio State University
June 27-29, 2005

Overview:

In general, I found the summary documentation to be thorough and well presented. Most chapters contained necessary information for adequately understanding the system being managed, the ongoing biological and ecological issues of concern, historical aspects of the Lake Istokpoga ecosystem, and current and future management plans and initiatives. It is clear that the staff has spent considerable time and energy on the development of the document, and the result is a report that is comprehensive and, in most cases, scientifically defensible. In this review I summarize the main points of each chapter and provide specific comments related to concerns that I have about the information provided. Many of the comments are minor, and focus on editorial issues or material presentation. More substantive comments and questions are provided in the sections relating to fisheries ecology and management (my areas of research experience).

I begin with an overview of the entire document and attempt to address the questions asked in the “request for expert assistance”. However, more detailed comments are provided on a chapter-by-chapter basis.

General review of entire document:

Here I attempt to address the questions listed in the “Request for Expert Assistance” for the document in its entirety:

1. Does the MFL document present a defensible scientific basis for setting initial minimum flows and levels within this water resource? Are the approaches or concepts described in the document scientifically sound based on “best available information?”. *In general, I would conclude that the document indeed presents a reasonable argument for establishing the MFL criteria proposed. I do, however, have a few primary concerns.*

A. The main area of concern I have relates to fisheries issues. As documented on a chapter-by-chapter basis below, I believe that there is simply not enough information provided to thoroughly assess the potential impacts of the proposed water-management strategies on fish populations and communities. There are a number of things that aren't particularly clear in the report, including 1) what data have actually been quantified and for what populations, 2) what were the spatial and temporal components of the data collections, 3) what attempts (if any) have been made to quantify data for non-game fish species, 4) when and how were angler surveys conducted, 5) what (specifically) monitoring strategies will be used going forward to determine the influence of the water-management plan on fish populations and communities? I believe this information is fundamentally important in the evaluation of the MFL document in relation to the potential influence of the proposed water-management strategies on fish populations and communities. This issue relates both to “scientific defensibility” and “best available information”. To consider the proposals scientifically defensible, the document should clearly establish what fish data are available, how and when they were collected and analyzed, and what will be monitored going forward.

With that in mind, I make three recommendations. First, I recommend that the authors

Exhibit B-2. Review Comments by Dr. D. Aday – Page 2 (Continuation).

go back to the Florida game and fish commission and make sure that all available data are included in the proposal. Second, I suggest that the authors draw on relevant literature to document the ways in which similar water-management strategies might influence fish populations and communities. This should be easy to do given the availability of studies conducted on similar systems in Florida (in particular, the authors should consult work done by Dr. Mike Allen of the University of Florida) and elsewhere (I have included some additional citations in the chapter-by-chapter summary below). Finally, I suggest that the authors carefully document what monitoring protocol should be developed as the project moves forward. In particular, I would suggest that the authors monitor size-specific abundance and distribution of important game and non-game fishes in Lake Istokpoga. It is also important that these data are collected in a way that minimizes bias (e.g., electrofishing, seining, etc.) rather than through angler surveys. Although angler surveys may provide good supplemental data, they are too biased and limited to serve as the backbone for analyses on the status of fisheries in the lake.

As one small caveat, I would point out that I commend the authors for generally taking an ecosystem-level approach to considering the impacts of these water-management strategies, and I certainly recognize that occasional tactics that may cause short-term harm to fisheries resources may ultimately translate into a net benefit for the system.

B. Another concern relates to the argument made for not including water quality considerations in the MFL decision. Although I believe it may be fair to argue that water-quality data are inadequate, I don't think the arguments and assumptions, as stated, are scientifically defensible. I think that there is likely to be a strong link between water level and water quality, particularly in relation to nutrient inputs. I think better support for this argument is necessary, along with, perhaps, inclusion of a discussion of and/or references for the "alternative stable states" hypothesis or other primary ecological theory related to nutrients, the dynamics of macrophyte-algal interactions, and associated influences on water quality (e.g., Hargeby et al. 2004). As well, there may be system-specific reasons that these water-quality/water-level relationships exist. Regardless, those should be more clearly documented in the proposal so that the reader clearly understands the assumptions your MFL rests upon.

C. Finally, I wonder about the importance the authors place on the data from the 2001 drawdown. In a number of cases, they suggest a generally positive outcome on floral and faunal communities in the ecosystem. However, because many of the species present are long-lived and have long generation times, I'm not certain that it is scientifically defensible to use this recent drawdown as a foundation for comparison, particularly in the context of recommending future drawdowns. It would seem that much longer-term collections would be necessary to adequately assess the influence of that drawdown on the ecology of the system and its inhabitants. Although I don't necessarily recommend excluding the discussion of the drawdown itself (and perhaps the data collected thus far), I do think the authors tend to overstate the positives when the actual impact of the 2001 drawdown may not yet be fully recognized (and even the presumed short-term benefits may not yet be completely understood). I think there needs to be more discussion of the limitations of the data collected so far and a better consideration of some of the potential drawbacks associated with similar events in the future. I don't believe that referencing this one-time, relatively recent drawdown, necessarily presents a defensible argument for recommending similar strategies in upcoming years. I recommend a more balanced treatment of the 2001 drawdown, including some consideration of the possibility that negative impacts have not yet

Exhibit B-2. Review Comments by Dr. D. Aday – Page 3 (Continuation).

been quantified due to the short time frame or inadequate data collections. In particular, the authors should reference work by Dr. Mike Allen on the potential negative influences of drawdowns on fish spawning and recruitment.

2. Are the proposed criteria logically supported by “best available information” presented in the main body of the document? What specific additions, deletions or changes are recommended by the expert to enhance the validity of the document? *As indicated in my answer to question one, I do not believe that the authors have supported their fisheries-related concerns with the best available information. This can be solved in two ways. First, they should be explicit about what data currently exist regarding fish populations and communities in Lake Istokpoga (particularly associated with the drawdown event in 2001), and make sure that all available (relevant) data are included in the proposal so that the potential impacts of the MFL can be adequately assessed. Second, they should cite current literature related to the influence of water-management strategies and water-level drawdowns on fish populations and communities. As indicated above, there are a number of good sources on systems similar to Lake Istokpoga that could be used for reference.*

3. Are there other approaches to setting the criteria that should be considered? Is there available information that has not been considered by the authors? If so, please identify specific alternatives to setting the MFLs and the data available to validate the alternative approach. *I think that the approach the authors used was adequate and logical. As indicated in my response to questions one and two, I do think that there are instances in which their arguments might be strengthened by broadening the context to other systems (including, if possible, some outside of the state). I have made some specific reference suggestions in the sections below. I don't believe that this would change the arguments made or the outcome of the decision. I do think, however, that it would strengthen the case they are making in certain instances. This is particularly true in the areas of general ecological and fisheries theory (e.g., water quality, influence of water-level fluctuations on fish habitat and fisheries), which are not system-specific concerns.*

Chapter summaries and comments:

I. Executive Summary:

A. Background Information: The executive summary concisely documents background information on the Lake Istokpoga ecosystem and details plans associated with its management. The major points of importance covered in the executive summary included:

- Lake managed for flood prevention, recreation, fish/wildlife habitat, and water supply
- New water diversions have changed the ecology of the watershed
- Definition of significant harm, and references Chapter 373 for water resource functions
- Identification of valued ecosystem components (wetlands and fisheries)
- MFL criteria: 36.5 NGVD for 20+weeks, greater than every 4 years.

B. Questions and Comments:

1. Bottom pg. iii: Assuming the discussion of patterns of drying and flooding is refers to a natural flood pulse? Some additional discussion of the ecological importance of flood pulses here or elsewhere would be useful for the reader.

Exhibit B-2. Review Comments by Dr. D. Aday – Page 4 (Continuation).

2. A detailed definition of NGVD would be useful here for readers unfamiliar with this measurement.
3. Here (and throughout document): when the NGVD is referenced, how is water level measured? I assume this is a mean water level, but it's not clear at this point how and where those water levels are taken.

II. Chapter 1:*A. Background Information:*

- Water management districts annually review priority list schedules and make revisions
- MFLs are not stand-alone tools, but part of larger resource protection responsibilities.
- Outline of specific factors to consider in setting MFL
- Need for establishment of resource functions for protection and identification of baseline conditions.
- Definitions of "harm".
- Water shortages and phases of restrictions (1 & 2 = prevent harm. 3 & 4 require use cutbacks that may cause economic impact).
- Provision for development of a recovery and prevention strategy if MFL is violated.

B. Questions and comments:

1. Middle paragraph on page 3: could this be restructured to make less confusing? There is a reference to minimum flow and then minimum level, but it's not clear how these are related (i.e., if the flow is low is the level also low? Can you have one without the other?).
2. Top of page 4: the phrase "natural seasonal changes in water flows or levels" is used. Does this refer to a natural flood pulse (or something similar) that apparently no longer exists in Lake Istokpoga? If so, is there some desire to restore this (despite the fact that the documentation makes clear that these plans are not designed for restorative purposes)?

III. Chapter 2:*A. Background Information:*

- Provides detailed background information on Lake Istokpoga itself, the water control structures, the climate, the land use and hydrology, the biological resources, water quality issues, water resource issues, and other projects associated with the management of Lake Istokpoga and the surrounding watershed.

B. Questions and comments:

1. Pages 13-14: I'm having a difficult time visualizing the physiography of the region. Is there any way that this could be presented graphically?
2. Figure 9 is poor and difficult to interpret. If this figure is necessary, it should be revised.
3. Top of page 22: The description of the FAS needs to be more clear. Without detailed understanding of the area and of aquifer systems, it is very difficult to follow this description.
4. Bottom of page 24: The relationship between stage and area for the lake is described as "almost linear". My view of this relationship would be that it is asymptotic.
5. Page 25: Elevations are now discussed in terms of sea level rather than NGVD used earlier. More consistency would make the document easier to read and interpret.

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6. Page 28: Describes a 12-year period of record. Should this not be an 11-year period?
7. Page 29: How was evapotranspiration estimated?
8. Page 35: At the bottom, a large-scale vegetation management and treatment project is referred to, but there is no additional supporting information. I would recommend including, at this first mention, a detailed description of the Floridone treatment mentioned later in this chapter (e.g., what is Floridone, how was it applied, what effects might be recognized beyond just aquatic vegetation removal, etc.).
10. Page 38: How were the surveys of fish populations and communities conducted? When? By whom? The same questions apply to the angler surveys. Much more information is needed here (and in other chapters when referring to fisheries data) to gain an accurate understanding of the fisheries-related issues in Lake Istokpoga [see additional comments in upcoming chapters].
11. Page 43: Is there no TDML for Lake Istokpoga? If not, why not? If so, some information should be provided here.
12. Page 52: What is the source of the mercury?
13. Page 56: The description of pools in the Kissimmee River would be easier to follow if there was a map or graphical illustration to reference.
14. Section on Lake Istokpoga Resource Protection Programs: This is valuable information for the reader. It is good to know how the current plan fits with existing management plans and initiatives for the lake and surrounding ecosystems. However, it's not clear from reading this how these all fit together (e.g., what is the level of cooperation and coordination among projects in terms of working towards a common goal? Is there data sharing or leveraging of ideas among projects?...etc.). Would it be possible to provide additional summary information that discusses how these projects all fit together to address watershed issues throughout the region?

IV. Chapter 3:*A. Background information:*

- Water resource functions: supply, flood control, quality, habitat, and recreation.
 - primary goals are flood protection and water supply.
- Water quality issues – better in wetlands, worse in tributaries (especially nutrients).
- Hydrological changes (Alterations of hydro patterns, reduced water tables and wetlands, drainage and diversion, alteration of water courses, construction of ditches and canals, changes to seasonal flood patterns).
- Discussion of considerations (Natural systems, hydrology, water supply, flood protection, water quality, navigation and recreation).
- Discussions of exclusions (no Section 373 exclusions).

B. Questions and comments:

1. Page 59: Water storage is mentioned under “water supply and flood control”. This is very general and vague; some additional discussion (and quantification, if possible) would be useful. For example, how much storage is possible? What parameters are used to determine when water is stored or passed? Are these seasonal or day-to-day decisions?
2. Page 60: Under the “water quality” subsection, the low water quality of tributary inflows is mentioned. Is there any effort to address or remedy this problem (related primarily to agriculture – tillage, tiles, alternate fertilizers, etc.)?

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3. Page 61, top: The way the first paragraph reads implies that the undeveloped creeks and lakes are not important wildlife habitat. It would seem that these areas could be as or more important than the “remaining water bodies and wetlands” described in the following sentence. Should this be revised, or is there some reason that the creeks and lakes are not as valuable as they would seem to be?
4. Page 61: Small semantic issue: the term “fishery” is used. This term implies a human-use component that would not be appropriate when describing a fish communities’ importance to wildlife issues in general. The terms “fishery” and “fisheries” should be reserved for discussions of fish populations or communities subject to harvest by anglers.
5. The “Considerations” section: In my opinion, this section should be modified to include a separate subsection for fish and wildlife issues. Although these are mentioned briefly within the subsection “natural systems”, the current presentation fails to reflect the ways in which fish and wildlife issues are biologically and ecologically connected to each of the other subcategories listed. That is, fish and wildlife issues are influenced by hydrology, water supply, flood protection, water quality, and recreation. Therefore, these seem to warrant a separate subcategory that acknowledges their importance and the necessity of considering their links to each of the other areas of consideration.
6. There is a typographical error on the top of page 64 (second sentence should read “The construction of numerous.....” rather than “The construction of a numerous....”).

V. Chapter 4:*A. Background information:*

- Provides conceptual basis for MFL (minimum flow is only one component, need for best available information, etc.).
- Listing of notable changes to system in previous century (Stabilization of water levels, alteration of seasonal patterns, alteration of flowways, draining of floodplain, nutrient pollution, nonnative plants, organic sediment accumulation).
- Listing of management objectives (provide periodic drawdowns to approximate low water conditions, provide a more natural pattern of seasonal water levels, protect and enhance wetlands, improve water quality).
- Identification of other programs in Florida lakes.
- Identification of historic hydrological conditions.

B. Questions and comments:

1. Page 67: The “adaptive approach” to management mentioned in this section is to be commended, however, additional information would be useful. For example, when are evaluations and changes going to take place? What are the logistics associated with making changes if they are deemed necessary?
2. I am surprised by (and have some concerns regarding) the management objectives for Lake Istokpoga described on page 68. In particular, I’m surprised by objective 1 (“Provide periodic drawdowns....”). Although this seems like an important consideration, the timing and implementation of these drawdowns could have serious impacts on the other important issues mentioned throughout the document (water levels, fish and wildlife habitat, consumptive use, etc.). In particular, I have concerns about drawdowns and their potential impact on fish communities. Spawning and habitat use by important recreational (e.g., largemouth bass, bluegill, and crappie) and non-game species could be

Exhibit B-2. Review Comments by Dr. D. Aday – Page 7 (Continuation).

influenced to a significant degree by the number, timing, and duration of drawdown events. If these were implemented, I would recommend providing far more detail about the logistics of the drawdowns and a careful consideration of the potential impacts on fishery resources. Literature is available, in particular, on the influence of reservoir drawdowns on largemouth bass spawning, movement, and behavior, and this and other similar literature should likely be consulted (e.g., Kohler et al. 1995; DiCenzo et al. 1995; Rogers and Bergersen 1995; Raibley et al. 1997). Although the authors seem to be encouraged by fishery data following the earlier drawdown, I would suggest that it may be too early to determine the actual impact of that drawdown on the ecology of the system and the associated fish populations and communities. In addition, because only limited information is provided on how the fishery surveys were conducted, it is difficult to determine whether the data are a reliable indicator of the actual condition of the fisheries.

2. Page 69: Lake Okeechobee has significant aquatic habitat loss when water level decreases by only 1 foot. Could this present a similar problem in Lake Istokpoga? The reader is left wondering.
3. Page 73: Although the categories defined by the SJRWMD are somewhat semantically confusing, I really like the definition of different stages. This makes good sense ecologically. Was there any effort to develop a similar stage strategy for Lake Istokpoga? Would that approach not be valuable in Lake Istokpoga?
4. Page 74: Indicates that descriptive statistics were used to characterize the three water regime periods. Were those analyses adequate to answer the background questions you asked? Was there any feeling that additional “hard” statistical tests would be useful to actually quantify the differences among periods?
5. Page 76: Describes water supply issues and makes clear that water supply has been and may become a significant problem. If that is the case, why are additional drawdowns being considered? When would these drawdowns occur, and how would they impact the water supply issues addressed in this section? I find it interesting that the following statement is made at the bottom of page 76, “Lake Istokpoga’s water supply function is therefore not considered a constraint in developing MFL criteria at this time”. That seems to be contrary to previous statements that water supply has been and could continue to be a concern.
6. Water quality and lake levels, pages 77-78. I find it difficult to believe that there is a weak relationship between water levels and water quality. Although I agree that the “magnitude of these inputs to the lake is independent of water levels in Lake Istokpoga...”, this assumption fails to recognize that water level and water quality are likely inextricably linked. For example, the influence of nutrient inputs into the lake would presumably be quite different when water levels are low versus high, which would effect, among other things, the presence and persistence of macrophytes and algae (and the dynamics between the two), sunlight penetration and turbidity, and nutrient concentration. This, in turn, would influence the fish and invertebrates present, and could establish a feedback loop through nutrient recycling by certain fish (e.g., nutrient recycling by gizzard shad; Mather et al. 1995; Vanni and Layne 1997). Thus, it would seem that the timing of water-level fluctuations and the way in which they interact with seasonal nutrient fluctuations would have the potential to influence the entire ecosystem. It may be that there is not enough information on water quality to include it in the

Exhibit B-2. Review Comments by Dr. D. Aday – Page 8 (Continuation).

development of the MFL, but I would argue that the scientific assumptions leading to this decision are either incorrect or incomplete. I suggest that a more careful consideration of the potential relationship between water level and water quality be considered and described, even if the ultimate conclusion is that there is insufficient information to include it in the development of the MFL at this time.

7. Page 78: It is interesting that the chemical vegetation control resulted in an increase in chlorophyll *a* but not in algal blooms. Algae presumably increased substantially following the removal of macrophytes, and this would explain the chlorophyll *a* increase. Were these data quantified correctly? Perhaps some additional discussion could be provided here. In addition, the literature on “alternative stable states” (e.g. Janse 1997) and macrophyte-algae dynamics could be consulted and used as context for these considerations if similar future vegetation treatments are planned.
8. Page 79, Fish communities: As stated several times before, I find the information presented on fish communities inadequate to fully evaluate. This section states, “the effects of low water levels on the fishery resource were considered as part of the MFL criteria. Fish survey data, collected before and after the 2001 drawdown, and the impact of low water levels on critical habitats were examined to determine whether impacts occurred that persisted for more than two years.” Much more information is necessary. For example:
 1. What effects were considered?
 2. Which fisheries? Just largemouth bass, crappie, and bluegill? If so, what about important forage fish that influence each of the three sportfish?
 3. How were the data collected?
 4. What impacts were measured and how were they quantified?
 5. What temporal component allowed determination of impacts that persisted for more than two years?

In addition, I’m wondering about continued surveys. Will additional data be collected? It may be that effects of the drawdown will be more long-term, and may not show up for many years. This would be particularly true if the drawdown had an effect on forage fish populations, or on life-history characteristics of the sportfish (timing of maturation, age-at-first maturation, mortality schedule). Simple population parameters like measures of recruitment and size structure may not be adequate to determine the future dynamics of these fish populations and communities.

VI. Chapter 5:*A. Background information:*

- Provides historical context for understanding hydrology of Lake Istokpoga.
- Points out ecological value of both high and low water events.
- Provides table (table 14) that summarizes access status at different water levels.
- Summarizes water level requirements for wetlands.
- Summarizes analysis and recommendations

B. Questions and comments:

1. Last two paragraphs on page 89: The 2001 drawdown was only a few years ago. I’m wondering if there has really been time to assess the impact of that drawdown on a swamp community, which contains flora with much longer life spans and generation times. Are there plans for continued monitoring? The same question applies to the

Exhibit B-2. Review Comments by Dr. D. Aday – Page 9 (Continuation).

interpretation of data on the marsh community – is it too soon to say that the drawdown event was actually beneficial?

2. Table 15 – was any literature for systems outside of Florida consulted? Is this a comprehensive enough search to get adequate information for decision-making purposes?
3. Section on water level requirements of fish communities: Similar to comments on previous fishery-related issues, I still feel that more information is needed to adequately assess the influence of water-level management on fish populations and communities. For example:
 - What does “enhancement of fish habitats” mean? Because habitat requirements for different species are so variable, enhancement for one species may be detrimental for others.
 - The text suggests that the water drawdown caused a temporary reduction in numbers of some fish species, but that those quickly rebounded. How were these data quantified? What other factors were considered? My concern is that, just because numbers are returning to pre-drawdown levels doesn’t necessarily mean that the impact on the population(s) is well understood. When population density rapidly declines, it is often the case that fish will reproduce at younger ages and smaller sizes, which will, through time, result in a change in the age and size structure of the population. This is particularly important to consider with predatory fish like largemouth bass and crappie, which undergo ontogenetic diet shifts. The timing of their switch to piscivory can have a marked influence on other fish populations (e.g., bluegill) and can, therefore, really affect the entire aquatic community.
 - I think it’s too soon to say that significant harm was not documented. Again, we need to know what metrics were quantified, and we have to determine how long it might actually take to better understand the influence the drawdown may have had.
 - The text suggests that water-level drawdowns below 36.5 feet may reduce littoral zone habitats. I’m wondering if this is really a concern. It would seem that, in a lake that is only 4 ft deep on average, most of the lake would be littoral zone.
 - Top of page 92 – suggests that the change in water levels could reduce the quality of fish habitats and reduce spawning success. Again, this is difficult to interpret based on what is presented. The dynamics of fish populations are tied to so much more than spawning success that this seems difficult to defend without more detail. In some cases, reduced spawning success can be quite beneficial to fish populations. For example, reductions in spawning might help alleviate density-dependent growth limitations or recruitment bottlenecks. As such, a more detailed discussion of data collection procedures (past and future) is necessary to really understand and assess the influence of water-management initiatives on fish populations and fisheries.

VII. Chapter 6:*A. Background information:*

- Defined significant harm as occurring when water levels fall below 36.5 feet NGVD for 20 weeks or longer, more frequently than every four years.
- Describes rationale for proposed criteria in terms of fisheries resources.
- Goes over monitoring, prevention, and research recommendations.

B. Questions and comments:

1. It’s interesting to me that the rationale for proposed criteria focus almost exclusively on

Exhibit B-2. Review Comments by Dr. D. Aday – Page 10 (Continuation).

fisheries issues. Throughout the document, much more detail was provided on other aspects of Lake Istokpoga (e.g., hydrology, recreation, flood control, water supply, etc.). It's encouraging that fisheries considerations are so important, but I feel that more information is needed in the previous sections to better assess the potential impacts of water-level management on fish populations and communities.

2. Page 100: suggests that the FWC conducts annual fish catch surveys. Are there other data collections on fish populations and communities? Catch data can be notoriously unreliable, and samples only a few members of the fish community (and only a small fraction of the populations actually being harvested). I recommend that, if much of this water-management plan is built with fisheries issues in mind, a more rigorous sampling protocol be developed. Or, if more data have been and will be collected, that should be clearly described in this documentation so that it possible to assess the adequacy of those data collections to meet the needs of management-related goals.
3. On page 101, the 'Research Recommendations' section states that "birds, fish, aquatic and littoral zone communities are being monitored, as well as water quality...". This seems to conflict with the statement on page 100 (which says that no additional biological monitoring of parameters in Lake Istokpoga are proposed). More importantly, I don't think there is enough information to adequately assess the monitoring strategies. For example, how are the fish populations and communities monitored? When? By whom? What data are collected? This continues the theme of 'more information needed' to adequately critique the MFL as it relates to fisheries and fish populations and communities.

VIII. Appendices:

1. *Appendix A:* My only comment on this appendix is that it probably contains more material than is actually necessary. I think the statute information is valuable. I'm not sure that all of the letters and documentation associated with the tribal compacts, etc. are necessary (despite the fact that they are relevant to the MFL document).
2. *Appendix C:* Contains useful information. Figure C-1 is difficult to interpret. Table C-3 may not be necessary.
3. *Appendix D:* Contains useful information. It is a bit difficult to determine how the calculations are influenced by "unknown" or "unmeasured" sources of water input and output, and how much the MFL depends on these calculations. Over long-term averages, however, the data seem fairly reliable and the approach seems scientifically sound based on the data that are available.

Exhibit B-2. Review Comments by Dr. D. Aday – Page 11 (Continuation).**Literature cited:**

- DiCenzo, VJ, MJ Maccina, and WC Reeves. 1995. Factors related to growth and condition of the Alabama subspecies of spotted bass in reservoirs. *North American Journal of Fisheries Management* 15:794-798.
- Kohler, CC, RJ Sheehan, and JJ Sweatman. 1993. Largemouth bass hatching success and first-winter survival in two Illinois reservoirs. *North American Journal of Fisheries Management* 13:125-133.
- Hargeby, A., I. Blindow, and L-A. Hansson. 2004. Shifts between clear and turbid states in a shallow lake: multi-causal stress from climate, nutrients, and biotic interactions. *Archiv. Fuer Hydrobiologie* 161:433-454.
- Janse, JH 1997. A model of nutrient dynamics in shallow lakes in relation to multiple stable states. *Hydrobiologia*.
- Mather, ME, MJ Vanni, TE Wissing, SA Davis, and MH Schaus. 1995. Regeneration of nitrogen and phosphorus by bluegill and gizzard shad: effect of feeding history. *Canadian Journal of Fisheries Management* 52:2327-2338.
- Raibley, PT, TM O'Hara, KS Irons, KD Blodgett, RE Sparks. 1997. Largemouth bass size distributions under varying annual hydrological regimes in the Illinois River. *Transactions of the American Fisheries Society* 126:850-856.
- Rogers, KB and EP Bergersen. 1995. Effects of a fall drawdown on movement of adult northern pike and largemouth bass. *North American Journal of Fisheries Management* 15: 596-600.
- Vanni, MJ and CD Layne. 1997. Nutrient recycling and herbivory as mechanisms in the "top-down" effect of fish on algae in lakes. *Ecology* 78:21-40.

Exhibit B-3. Review Comments by Dr. T. Lodge – Page 1.**MEMORANDUM**

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To: John Zahina, SFWMD project manager for Lake Istokpoga MFL

From: Thomas E. Lodge

Date: July 1, 2005

Subject: Review of the first draft Technical Documentation to Support
Development of Minimum Levels for Lake Istokpoga, SFWMD Water Supply
Department, May 2005

Overview

This draft document presents a reasonable approach to the question of minimum level criteria to protect Lake Istokpoga from significant harm. There is a sufficient presentation of the lake's characteristics and uses to give the reader an adequate basis for understanding the potential impact of low levels. The data presented to support the draft MFL varies from very good (e.g. the level chosen roughly follows the lower elevation contour of the lake's existing emergent littoral zone) to weak (e.g. game fishery data used to evaluate the 2001 lake drawdown and a lack of specific data in support of an alleged deleterious succession of the littoral zone if longer or more frequent low levels would occur). However, while there were some shortcomings in the data used to develop the draft MFL criteria, nothing presented would support a contrary conclusion regarding the proposed MFL criteria. It is my opinion that the selected MFL criteria would protect Lake Istokpoga from significant harm.

General review of the entire document

1. *Does the MFL document present a defensible scientific basis for setting initial minimum flows and levels within this water resource? Are the approaches or concepts described in the document scientifically sound based on "best available information"?*

The basis used is scientifically defensible in that the following were considered: water quality; recreation and navigational access; fish and wildlife habitat; gamefish population rebound; and wetland/littoral zone succession and upland encroachment. However, many details were lacking that would improve scientific credibility, including adequate

Exhibit B-3. Review Comments by Dr. T. Lodge – Page 2 (Continuation).

Thomas E. Lodge
Lake Istokpoga draft MFL document review

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documentation of wading bird success, specific littoral zone successional expectations, especially involving cypress and the apparent current lack of successful recruitment among the larger, old cypress in the deeper portions of their habitat. While the littoral zone functions and successional processes may be beyond the scope of establishing MFL criteria (i.e. the entire fluctuation schedule as being examined in CERP is involved), there at least needs to be clear justification on why they are beyond the scope. Water quality is only briefly addressed as being beyond possible control by the MFL criteria, but more specific statements could have been made, such as the exterior loadings are not affected by MFL criteria.

2. *Are the proposed criteria logically supported by “best available information” presented in the main body of the document? What specific additions, deletions or changes are recommended by the expert to enhance the validity of the document?*

Much of the science alluded to in establishing the MFL criteria are limited and vague, although logically aimed toward good science. For example, health of the swamp community around Lake Istokpoga addresses only the community above elevation 39.5 ft. NGVD. Our field excursion on June 28, when the lake stage was reportedly at 38.4 ft., evidenced that most if not nearly all of the spectacular, old cypress were standing in water, so that they were probably mostly between 37 and 38 ft. There was no apparent recruitment among them. This very important aesthetic and functional role (e.g. support of huge numbers of osprey nests) that the older cypress play begs more documentation. Cypress recruitment data are available in literature sources.

The single drydown event that serves as the backbone of support for the MFL is too limited. Drydown studies on Florida lakes are abundant, including lakes Toho, Kissimmee, and Okeechobee, and could have been referenced for supporting documentation.

Additional concerns for the selected criteria are what would happen in the event that water levels would drop to very low levels within the allowed duration of 20 weeks. For example, the criteria would allow the lake to go completely dry so long as the excursion below 36.5 ft. was less than 20 weeks. While the probability of such an extreme is remote, possible very low excursions should be addressed in the document. However, it is recognized that the use of the established criteria is in judging the permissibility of a requested consumptive use of water. As such, it is improbable that the impact of very low excursions of water level would be realistic. Such calculated low levels would obviously tend to violate the 20 week recovery time and not be permitted under the draft criteria.

3. *Are there other approaches to setting the criteria that should be considered? Is there available information that has not been considered by the authors? If so, please identify specific alternatives to setting the MFLs and the data available to validate the alternative approach.*

Exhibit B-3. Review Comments by Dr. T. Lodge – Page 3 (Continuation).

Thomas E. Lodge
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The approach taken is sound. It merely needs additional supporting documentation as emphasized above.

Specific editorial comments by page numbers

Page iii. Significant harm is referenced in Chapter 373 requirements to include flood control, water quality protection, water supply and storage, fish and wildlife protection, navigation and recreation. However, on page iv, it is stated that significant harm "...for Lake Istokpoga is based primarily on impacts to the lake's biological resources...." The basis of not including the broader suite of categories needs a clearer explanation.

Page 14, second paragraph. The "Paleogene Epoch" should be changed to the "Paleogene epochs" as it represents the combined time of the Paleocene, Eocene, and Oligocene epochs.

Pages 24 (bottom) and 25. The text data do not all agree with the Figure 14. For examples, at 35 ft. the lake volume on Figure 14 is 48,075 ac-ft., not 62,500 ac-ft.; and neither graph extends to 43 ft. as inferred in the text.

Page 39, Table 6. The eastern mosquitofish is *Gambusia holbrooki*; the tadpole "darter" should be the tadpole madtom; and both bullheads listed are now in the genus *Ameiurus*, not *Ictalurus*. Also, a table in a paper by Furse, Champeau, Ford and others dated August 26, 2004 (presented at the Lake Istokpoga performance measures science review panel workshop of that date) included the following additional species, several of which may be important ecologically: blue tilapia (*Oreochromis aurea*), bowfin (*Amia calva*), brown hoplo (*Hoplosternum littorale*), channel catfish (*Ictalurus punctatus*), sailfin molly (*Poecilia latipinna*), walking catfish (*Clarias batrachus*), and white catfish (*Ameiurus catus*). A local resident brought a photograph of a brown hoplo to the MFL workshop and stated his observation of its nesting habit and difficulty in predation by ospreys.

Page 42, Plants and Animals of Special Concern. There is no mention of the snail kite – it should be included.

Page 52, first paragraph. I found no citations for the burhead sedge (*Osycaryum cubense*) until I discovered it as a synonym for the current name, Cuban bulrush (*Scirpus cubensis*). I suggest the latter names be used or referenced as synonyms.

Page 54, first paragraph last line. The proper name for the referenced aquifer is "Floridan" aquifer.

Page 83, second paragraph. I disagree that addressing environmental impacts from water level stabilization is beyond the project's scope. *Significant harm* of low water is relative to level fluctuations, and therefore tied to the history of fluctuation stabilization. Setting the level at the low elevation of the existing emergent littoral zone addresses the

Exhibit B-3. Review Comments by Dr. T. Lodge – Page 4 (Continuation).

Thomas E. Lodge
Lake Istokpoga draft MFL document review

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situation, so I think that the document and selected MFL are still valid, but the wording should reflect that setting a low level is relative to fluctuations that are ongoing and have caused harm by being too restrictive – thus the importance of the MFL being set below the existing control schedule.

Page 98, bottom paragraph. "...the annual average hydroperiod for lake wetlands may be reduced below the typical range for these community types." This statement is so vague and general that its value is limited. There is much more specific information available from other lake drawdowns that could be cited. I suggest this statement be reworded to reflect fishery recovery time and perhaps excessive interference with navigation and recreation, unless specific deleterious effects on littoral zone communities can be documented/referenced.

Exhibit B-4. Review Comments by Dr. J. Trexler – Page 1.

Review and Response to Questions
Prepared by Joel Trexler

Goals: limit at which further withdrawals would be *significantly harmful* to water resources or ecology of the areas

Significant harm: temporary loss of water resource functions... that take longer than two years to recover

Lake Istokpoga is a natural lake that provides important ecological services including (see list page 4):

- Fisheries (both recreational and commercial);
- Wildlife (e.g., large osprey populations, bald eagles, etc);
- Home to distinctive, if not unique, fringing cypress swamp (certainly a beautiful location).

Ecological harm would include, but possibly not be limited to:

- Loss of fishery characteristics;
- Change in trophic status of lake leading to low DO, continued accumulation of organic matter;
- Loss of bird populations;
- Loss of habitat character (fringing cypress swamp).

Key point: Three dimensions to MFL regulation for this lake are minimum depth, max length at depth, return time

1. a. Does the MFL document present a defensible scientific basis for setting initial flows and levels within this water resource?

The primary basis for the Minimum water level of 36.5 ft seems to be bathymetry of the lake and associated vegetation. Literature is reported indicating minimum hydroperiods needed to maintain the various vegetation types at key elevations. The duration of such low-water events appears to derive from experience obtain in the 2001 drought and draw-down event. That event lasted 19 weeks and may have provided benefits to fisheries, at least over a several year time interval. The return time for the minimum levels seems to be derived primarily from fisheries concerns and recruitment dynamics, though the connection is verbal.

Tugend and Allen (2004) provides a basis for using drawdown and herbiciding as a management tool for a similar lake in the same drainage

2001 was only one event... not replicated, endpoints could be different due to details of when in year and rate of water decline

Exhibit B-4. Review Comments by Dr. J. Trexler – Page 2 (Continuation).

1. b. Are the approaches described scientifically sound based on ‘best available information’?

Sticking to my own area of expertise, aquatic ecology and fishes, I found the fisheries material presented to be lacking. A report from the FWC is cited, but the tabular and graphical materials reproduced were not cogent to the arguments made. It is not clear to me if the necessary information is actually present in the reports, but statements made regarding the impact of the 2001 management actions or other periods must be taken on face value. That written, I found the conclusions drawn consistent with my expectations and suspect that they are correct, for whatever that’s worth. Results are consistent with recommendations for Florida fisheries management in Aumen and Gray (1995), Moyer et al. (1995), Allen et al. (2002), and Bonvechio and Allen (2003). Note that Aumen and Gray (1995) provide a basis to use historical ecological variation as a management target (rather than single-species goals that often yields conflicting recommendations across taxa).

My own work in the Everglades supports the idea that the longer the minimum level is retained, the more severe the mortality incurred by fish populations and the longer time required for recovery post-disturbance (Trexler et al. 2005). However, the population-level impact may be a minor component of the long-term population dynamics of fishes in a lake where large areas of aquatic habitat will be retained in low-water years and no aquatic taxa are actually at risk to be driven extinct. The return time of minimum levels (proposed to exceed four years) could also have major implications for population and community dynamics. The proposed minimum return time of four years is not well justified in the current document. However, four years seems reasonable in permitting recovery of aquatic communities from drought, and the generation time and age of first reproduction of the longest-lived fishes in the system. It would be nice to have a time series of population data from key fisheries taxa to exam this expectation. Bonvechio and Allen (2003) elaborate on these issues in the context of setting MFL for rivers and lakes in Florida. Again *for what its worth*, our data from the Everglades (parts of WCA-3A have some similarities to this lake), suggest that four years between droughts is a minimum to recover long-lived fish species and their communities both in terms of relative abundance of ‘desirable’ species like bass and their consumptive impact on prey species (Chick et al. 2004; Trexler et al. 2005). Data from Lake Istokpoga are sorely needed in this report.

One aspect of the impact of a low-water event is its timing with regard to fish recruitment. I know that M.S. Allen (UF) has worked on the relationship of largemouth bass recruitment in Lake Istokpoga and hydrology, but none of his work is mentioned here. Perhaps this is reviewed in the FWC’s report? The current plan assumes that the 2001 timing is consistent with any future drying event... is that reasonable?

Pages 52-53 mention mercury consumption advisory that is in effect. There was little concern about this in our visit to the lake. Was there any effect of the 2001 management action on mercury levels in fish?

2. Are the proposed criteria logically supported and what additions, deletions, or changes are recommended?

Exhibit B-4. Review Comments by Dr. J. Trexler – Page 3 (Continuation).

The report is impressive in the breadth of material considered. Presumably the ecological data available for such an analysis are limited and concepts must be drawn from nearby systems where information is available. Ideally, there would be more quantitative data on ecological relationships of aquatic communities to water levels, water-level fluctuation, and drought return times. For me, a telling comment in the document was that cypress and mixed hardwood communities that historically fringed the lake are no longer producing recruits because of hydrological stabilization. Some quantitative data on this would be useful. However, since this criterion does not address operation schedules per se, this clear 'harm' of ecological function is not explicitly addressed. Clearly, periodic excursions to the minimum level proscribed here may actually be *mandatory* to avoid 'harm' to ecological structure of the remaining habitat of the lake.

3. Are there other approaches to setting the criteria that should be considered?

I found the review of approaches used by St Johns WMD and Southwest Florida WMD useful in setting a context for this analysis. I do not have suggestions for alternative approaches at this time. However, a stronger case could have been made through the use of simulation models to justify the choice of return time for the minimum level. I'm surprised that some general analysis of this type that identifies key parameters to be tracked for specific lakes has not been developed by the FWC. The use of GIS and bathymetry for proposing the level was convincing, when linked to the practical issues of navigation, etc. It would seem that the FWC would actually have fisheries monitoring data that would permit development of a statistical relationship of fish population dynamics and length of dry-down. Further, I know that the seasonal timing of the dry-down has a huge impact on nesting and recruitment success. This is not addressed in the current report... this is more relevant to regulatory schedule.

Exhibit B-4. Review Comments by Dr. J. Trexler – Page 4 (Continuation).

I have noted a few problems in reporting references in the notes below. Notes made while reading the text:

Page 21: What is the composition of the materials in Undifferentiated elastic deposits and Tamiami Formation and the Hawthorn Group geological units? The lower deposits are all limestone. I wondered about this because of the implications of these materials on nutrient dynamics on the surface water and then became frustrated by the lack of consistency in reporting in this table.

Page 37: Cypress swamp mixed veg is not reproducing because of water level stabilization. This seems important and warrants elaboration and DATA presentation

Page 38: References hard to follow: FWC 2003... no such reference; Champeau 2003 is listed as 2004 in the literature cited section

Page 39: Several errors in taxonomy need correcting... I caught these (the correct names listed below, should be easy to link to errors on the page):

Gambusia holbrooki

Notropis emiliae

Ameiurus natalis

Tadpole madtom

Pages 40-41: Conclusions about recruitment and age classes, etc, cannot be inferred from figures 20 and 21. There is no evidence to support the statements listed and the figures are useless. Need to insert graph showing length by age or otherwise indicate cohorts on the length-frequency histograms to make this useful.

Page 52: FWC 2002 reports that fish surveys indicated an increase in fish species richness and abundance following 2001 drought/drawdown/vegetation control; No data are presented to support this contention... are such data in the FWC report?

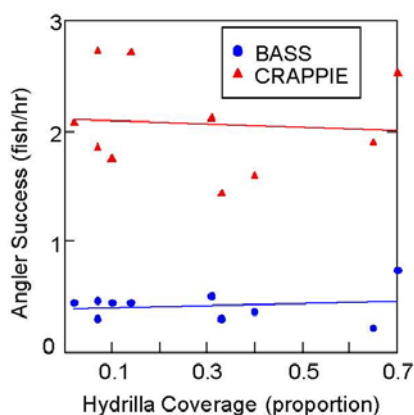
Page 53: Lake has mercury alert for fish consumption; what is status in years since 2001? Is there any evidence that drawdown had an impact (positive, negative, none) on mercury levels in key taxa?

Exhibit B-4. Review Comments by Dr. J. Trexler – Page 5 (Continuation).

Page 54, Table 10: No measure of repeatability on these numbers.... 2000-2001 data are clearly skewed by low water/concentration event. This table tells us nothing about fisheries; pre-drawdown data are lower and higher for all taxa. Sunfish reporting is particularly useless with a change in reporting in mid-project. Are the two species summed comparable to the data from 1991 – 1995? No explanation or quantitative linkage was made between *Hydrilla* data and fisheries (see Allen et al. 2003, who also found no relationship in these variables). Since these data don't show a relationship, why are they reported... what's the point?

Table 1. Pearson correlations of data from FWC (2003).
None are significant.

	HYDRILLA	BASS	CRAPPIE
HYDRILLA	1		
BASS	0.16	1	
CRAPPIE	-0.079	0.593	1



P70: need to report the 'significantly altered' term per SWFWMD for clarity

Page 71: need definition of 'significantly altered' or note that none is available.

Page 78: Vegetation management effects and low water on nutrient releases not established well enough to include in this analysis.

Page 91: Concludes that 2001 drawdown event caused only short-term negative impact on some fish communities; can't evaluate that from data presented.

Exhibit B-4. Review Comments by Dr. J. Trexler – Page 6 (Continuation).

Page 94, bottom: periodic short-duration low-water events don't create harm... could mention benefits here. Recruitment of cypress requires dry periods in fringing swamp habitat?

Page 98: Criterion relies on 2001 experience where drawdown below 36.5ft for 19 weeks did not lead to "harm"

Page 100: Monitoring strategy DO? Should provide a table of monitoring provided by Florida Lakewatch and those parameters deemed critical for monitoring MFL... can't assume Lakewatch continues to provide quality data on this system for enforcement into indefinite future. More data on fisheries monitoring is needed... what is actually being done and what is critical to evaluate MFL? Also, need monitoring of vegetation independent of enhancement projects. This should include cypress swamp vegetation, with ability to track recruitment.

Literature cited or that should be considered for citation in this report:

Allen, M. S., K. I. Tugend, and M. J. Mann. 2004. Largemouth bass abundance and angler catch rates following a habitat enhancement project at Lake Kissimmee, Florida. *North American Journal of Fisheries Management* 23:845-855

Allen, Micheal S. and Kimberly Tugend. 2002. Effects of a large-scale habitat enhancement project on habitat quality for age-0 largemouth bass at Lake Kissimmee, Florida. *Proceedings of the International Black Bass Symposium 2000*, American Fisheries Society, Bethesda, Maryland.

Aumen, N. G., and S. Gray. 1995. Research synthesis and management recommendations from a five-year ecosystem-level study of Lake Okeechobee, Florida (USA), *Archiv fur Hydrobiologie* 45:343-356

Bonvecchio, T. F., and M. S. Allen. 2005. Relations between hydrologic variables and year class strength of sportfish in eight Florida waterbodies. *Hydrobiologia* 532:193-207

Chick, J. H., C. R. Ruetz III, and J. C. Trexler. 2004. Spatial scale and abundance patterns of large fish communities in freshwater marshes of the Florida Everglades. *Wetlands* 24:652-664

Moyer, E. J., M. W. Hulon, J. J. Sweatman, R. S. Butler, and V. P. Williams. 1995. Fishery responses to habitat restoration in Lake Tohopekaliga, Florida. *North American Journal of Fisheries Management* 15:591-595

Trexler, J. C., W. F. Loftus, and S. Perry. 2005. Disturbance frequency and community structure in a twenty-five year intervention study. *Oecologia*, in press (proof is attached)

Tugend K.I. and M. S. Allen. 2004. Changes in the plant and fish communities in enhanced littoral areas of Lake Kissimmee, Florida, following a habitat enhancement. *Lake and Reservoir Management* 20:54-64

Exhibit B-4. Review Comments by Dr. J. Trexler – Page 7 (Continuation).

Walker, W. W. and K. E. Havens. 2003. Development and application of a phosphorus balance model for Lake Istokpoga, Florida. Lake and Reservoir Management 19:79-91

Exhibit B-5. Review Comments from the Office of Water Policy, Florida Department of Environmental Protection – Page 1.



Jeb Bush
Governor

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Colleen M. Castille
Secretary

September 6, 2005

John Zahina
South Florida Water Management District
P.O. Box 24680
West Palm Beach, FL 33416-4680

Re: Lake Istokpoga MFL

John
Dear Mr. Zahina,

The Department appreciates the opportunity to review the technical document for establishing the minimum flow and level (MFL) for Lake Istokpoga. The report clearly describes the natural features of the lake and explains the District's methodology for determining the MFL. The Department would like offer the following comments as you finalize the document and prepare to adopt the MFL by rule. Most of these, we discussed on the phone a few weeks ago.

Expression of the MFL

As we discussed on the phone, the current language could be interpreted several different ways that may allow the lake levels to fall below an elevation of 36.5' for extended periods that may result in significant harm. We suggest that the language be revised to reflect the District's intent that the lake elevation not to fall below 36.5' for any more than 20 weeks within a 365 day period and that event should not occur more often than once every 4 years. Additionally, the 20 week duration should be considered cumulatively over the 365 day period.

Multiple Levels

As MFLs have been developed throughout the state, the need to establish multiple flows or levels to adequately capture the natural variability of the system has become apparent. New amendments to Section 62-40.473 (2), F.A.C. state the following:

(2) Water bodies experience variations in water flows and levels that often contribute to significant functions of the system, such as those described in section 62-40.473(1), F.A.C. Minimum flows and levels should be expressed as multiple flows or levels defining a minimum hydrologic regime to the extent practical and necessary to establish the limit beyond which further withdrawals would be significantly harmful to the water resources or the ecology of the area as provided in Section 373.042(1), F.S. However, a

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Exhibit B-5. Review Comments from the Office of Water Policy, Florida Department of Environmental Protection – Page 2 (Continuation).

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minimum flow or level need not be expressed as multiple flows or levels if other resource protection tools, such as reservations implemented to protect fish and wildlife or public health and safety, that provide equivalent or greater protection of the hydrologic regime of the water body, are developed and adopted in coordination with the minimum flow or level.

The report indicates that there is a significant community of cypress trees fringing a portion of the lake. It is not clear how the proposed MFL will ensure protection of this cypress community and it seems that multiple levels might be necessary to protect all of the lake's resources. Based upon our discussion on the phone, you indicated that there were some structural considerations that prevented the establishment of multiple levels and that one problem was that water levels were too high within the cypress community. It would be helpful if the technical document had a more thorough discussion of the existing levels that occur in the cypress community and the constraints that surrounding development might place on establishing multiple levels to protect this community.

Relationship Between Lake Drawdown and MFLs

Page 100 of the report indicates that there may be circumstances to “conduct controlled drawdowns in magnitudes or frequencies that exceed the proposed MFL criteria...” The report further notes that the proposed MFL criteria do not restrict the ability to conduct controlled drawdowns. The peer review also noted that there were problems with basing recommendations on the frequency and duration of drawdowns on the short term results from one recent event. Please note that if drawdowns occurred more frequently and for a longer duration than allowed under the MFL, that could be considered an exceedance of the MFL criteria. The District should revise this section of the report to indicate that further research is needed regarding the appropriate frequency and duration of drawdowns and that drawdowns will not be conducted in a manner that will exceed the MFL criteria.

Additionally, Section 40E-8.421(9) of the draft rule states that extreme drawdowns will be avoided “to the greatest extent possible”. This language seems to be inconsistent with the MFL criteria and should be revised as follows:

The District, in coordination with other appropriate agencies, should also plan and operate extreme Lake drawdowns for environmental purposes in a manner that, to the greatest extent possible, avoids a MFL violation.

Peer Review and Water Quality

The peer review suggested that the District provide additional information related to certain areas of the report especially with respect to water quality. I understand the District is going to revise this section of the report. Please note that Lake Istokpoga is identified as an impaired water body in the Department's *Draft Verified List of Impaired Waters for the Group 4 Basins* (July 7, 2005) and is tentatively scheduled to have a TMDL developed by 2010. For more information regarding the development of this TMDL, you may contact Dr. T. S. Wu at 850-245-8457. The

Exhibit B-5. Review Comments from the Office of Water Policy, Florida Department of Environmental Protection – Page 3 (Continuation).

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Department would also like to know of any additional changes that the District makes in response to the concerns identified by the peer review.

In summary, it appears that the proposed analysis adequately considers the resources of Lake Istokpoga and that they will be protected from significant harm. It would be helpful if the District modified or expanded some sections of the report to address the items identified in this letter and by the peer review. The monitoring and research proposed to be conducted will help the District determine whether additional modification may be necessary.

Please feel free to contact me at 850-245-8681 (suncom 205-8681) or by email at kathleen.greenwood@dep.state.fl.us if you have any questions.

Sincerely,



Kathleen P. Greenwood
Office of Water Policy

cc: Janet G. Llewellyn
Tom Swihart
Dr. T.S. Wu